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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/525,176 | 03/14/2000 | Savvas Vasileiadis | | 7655 |

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EXAMINER

VANOY, TIMOTHY C

ART UNIT

PAPER NUMBER

1754

DATE MAILED: 07/10/2003

23

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/525,176

Applicant(s)

VASILEIADIS et al

Examiner

VANOY

Group Art Unit

1754

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE THREE MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on THE AMENDMENT FAXED ON MAR. 29, 2003 AND THE DECISION ON PETITION MAILED ON JULY 1 2003.
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 134-173 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 134-173 is/are rejected.
- ☒ Claim(s) 138, 143, 145, 146, 148, 149, 156, 159, 163, 164, 166 AND 167 is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☒ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____.
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s) 18
- ☐ Notice of Reference(s) Cited, PTO-892
- ☒ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Interview Summary, PTO-413
- ☐ Notice of Informal Patent Application, PTO-152
- ☒ Other SECTION 2144.07 IN MPER
- FOR DRAWINGS DATE-STAMPED JUNE 3, 2002

Office Action Summary

DETAILED ACTION

Election/Restrictions

This Office action is in response to the decision on petition to withdraw the restriction requirement mailed on July 1, 2003 (paper no. 21), which rejoined all of the non-elected claims.

Since all claims previously withdrawn from consideration under 37 CFR 1.142 have been rejoined, the restriction requirement mailed on Jan. 9, 2003 (paper no. 17) is hereby **withdrawn**. The basis of this office action is the claims presented in the amendment faxed on March 28, 2003 (paper no. 22), and the claims remaining in the amendment dated November 1, 2002 (paper no. 16).

Response to Applicants' Request that claims renumbered under Rule 1.126 be Renumbered again.

On pg. 11 in the amendment faxed on March 29, 2003 (paper no. 22), the applicants' request that claims 134-173 be renumbered 1-12 is denied, since claims renumbered under Rule 1.126 are not renumbered again.

Response to Applicants' Substitute Specification faxed on Mar. 29, 2003

The Applicants' substitute specification faxed on March 29, 2003 has been entered.

Specification

In this application, the abstract submitted with the amendment faxed on March 29, 2003 (paper no. 22) is objected to because it purports the merits of the invention in line 2, rather than details of the invention. The phrase "with increased mass and heat transfer, reactant conversion, product yield and" should be deleted. In line 5 in the abstract, the period after "dioxide" should be deleted.

Claim Objections

- a) Claim 138 (in the amendment date-stamped November 1, 2003) is objected to for being replete with grammatical informalities. For example, the phrase "with the reject exit stream from the most inner and next inner annular zones to have the contained steam removed by condensation, and subsequently be passed. . ." should be replaced with "with the reject exit stream from the most inner and next inner annular zones is subject to a condensation step which removes steam from the reject exit stream, and subsequently passed. . .". Additionally, the phrase "contained in stream" set forth in line 3 should be deleted. Additionally, the phrase ", with the separated hydrogen and carbon dioxide product mixture to be used as a combined fuel-oxidant feed in a molten carbonate fuel cell" at the end of the claim should be deleted.
- b) Claim 143 (in the amendment date-stamped November 1, 2003) is objected to for being grammatically informal. In line 1, "and" should be replaced with "and/or". In line 3, "consecutive" should be replaced with "subsequent". In the last three lines of claim 143, the phrase "which is used. . . and gas engines" should be deleted.

c) In claim 145 (in the amendment date-stamped November 1, 2003) is objected to for being grammatically informal. In line 1, "with the" should be replaced with "wherein". In line 1, "by the fuel cell" should be replaced with "by a fuel cell" and "to be" should be replaced with "is".

d) In claim 146, (in the amendment date-stamped November 1, 2003) is objected to for being informal. In line 1, "with the" should be replaced with "wherein", and "comprises steam and carbon dioxide and" should be inserted between "cell" and "containing". In line 2, ", to be" should be replaced with "is".

e) In claims 148, 149, 156, 159, 163, 164, 166 and 167 (in the amendment date-stamped November 1, 2003), "with" in line 1 should be replaced with "wherein".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The person "having ordinary skill in the art" has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The references of record in this application reasonably reflect this level of skill.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 134-137, 139, 140, 142, 152-155 and 170-173 are again rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Document No. 04-182,302 A (hence "JP-302").

Fig. 1 and the description of Fig. 1 set forth in the "Practical Examples 1 and 2" on pgs. 13-16 in the English translation of JP-302 describes an obvious variation of the same method for the steam reformation of hydrocarbons to produce hydrogen and carbon oxides, comprising the steps:

feeding a mixture of steam and the hydrocarbons through inlet (10) into a reactor (100) so that the steam and hydrocarbons react over a Ni on alumina catalyst (16) contained between what appears be a Pd alloy membrane (18) and an outer wall (14)

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so that the catalyst promotes the conversion of the hydrocarbons and steam into hydrogen and carbon oxides, while being subjected to heat from a heater (12);

transferring a portion of the hydrogen and carbon oxides-containing gas through a gas/liquid separator (28) which separates at least some of the steam/water from the hydrogen-containing mixture *which corresponds to the Applicants' "most inner membrane" since it serves the same purpose of removing some of the water/steam from the hydrogen-containing reaction mixture: please compare the paragraph bridging pgs. 10 and 11 in the English translation of JP-302 to the 1st full paragraph on pg. 7 in the Applicants' specification as originally filed;*

transferring the steam-depleted hydrogen -containing gas mixture through a membrane reactor 200, where the hydrogen is selectively separated from the gas mixture via passage through membrane 36 *which corresponds to the Applicants' "next inner membrane" which is surrounded by what appears to be an impermeable outer wall 34 which corresponds to the Applicants' "far outer impermeable" wall, and*

collecting pure hydrogen from the membrane reactor 200 via line 38.

No unobvious distinction is seen between the materials that the membranes are constructed of; the sources of the hydrocarbon feeds and the steam reformation catalyst used.

The difference between the Applicants' claims and the process illustrated in Fig. 1 in the English translation of JP-302 is that the Applicants' claims call for the use of what appears to be a permeable membrane that allows the passage of the hydrogen and only a portion of the remaining reaction species there through (i. e. the "most inner

membrane") with passage of a sweep gas that sweeps away the permeated reaction products from the "most inner membrane", whereas the process of JP-302 uses what appears to be a cooler to condense out some of the water from the hydrogen-containing reaction gas to produce the same hydrogen gas containing only a portion of the remaining reaction species without using any sweep gas to sweep it away from the cooler.

Pg. 2 in the English translation of JP-302 describes a prior art technique for collecting hydrogen generated from the steam reformation of hydrocarbons by injecting the steam and the hydrocarbons into a catalytic unit to produce the reaction gas containing hydrogen, carbon oxides, steam, etc, and passing the reaction gas through a 1st hydrogen permselective membrane so that the hydrogen and a portion of the steam (please also see pg. 6 lns. 3 and 4 in the English translation of JP-302) permeate through the membrane, and is separated and collected. The 2nd full paragraph on pg. 6 in the English translation of JP-302 sets forth that a "method is known" by which an inert gas (in this case, argon) sweeps the hydrogen-containing gas that has permeated through the membrane away from the membrane so that difference in the hydrogen partial pressure on the two sides of the membrane is increased (evidently, so that the reaction equilibrium between the reagents and products is shifted to favor the products).

It would have been obvious to one of ordinary skill in the art at the time the invention was made *to modify* the process illustrated in Fig. 1 in JP-302 *by substituting* the membrane (and concomitant sweep gas) described in the last paragraph on pg. 6 in the English translation of JP-302 *in lieu of* the "cooler" 28, in the manner that would

arrive at the invention of the Applicants' claims, *because* of the advantage of *not only* removing a portion of the non-hydrogen components out of the hydrogen-containing gas (which the "cooler" 28 of JP-302 does) *but also* shifting the reaction equilibrium to favor the production of even more hydrogen by sweeping the permeated hydrogen away from the face of the membrane, as described on pgs. 5 and 6 in the English translation of JP-302.

Claims 134-173 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 4-182,302 A, as applied to claims 134-137, 139, 140, 142, 152-155 and 170-173 above, and further in the discussion of the court decisions set forth in section 2144.07 in the MPEP (Feb. 2003).

The difference between the applicants' claims and JP 4-182,302 A is that applicants' claims 138, 141, 143-151 and 156-169 is that these claims recite the intended use of the hydrogen produced by the process set forth in claims 134-137, 139, 140, 142, 152-155 and 170-173, *however* it is submitted that this difference would have been obvious to one of ordinary skill in the art at the time the invention was made *because* the courts have already determined that such art-recognized suitability of the known material for its intended use is *prima facie* obvious: please see the discussion of the *Sinclair & Carroll Co. vs. Interchemical Corp.* 325 at 335, 65 USPQ at 301 court decision set forth in section 2144.07 in the MPEP (Feb. 2003), where it is set forth "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw

puzzle". In this application, the "list" are the known processes set forth in applicants' claims 138, 141, 143-151 and 156-169 that use hydrogen as a fuel, and the "known compound" is hydrogen.

Response to Arguments

The Applicants' arguments submitted in their Amendment mailed on March 29, 2003 (paper no. 22) with respect to the pending claims have been considered but are not persuasive.

a) *The applicants argue that the 103 rejection is in error because JP 04-182,302 A claims a method for making hydrogen in two different vessels, rather than a single integrated vessel – as in the applicants' claims.*

It would have been obvious to one of ordinary skill in the art at the time the invention was made *to modify* the process illustrated in Fig. 1 in JP-302 *by substituting* the membrane (and concomitant sweep gas) described in the last paragraph on pg. 6 in the English translation of JP-302 *in lieu of* the "cooler" 28, in the manner that would arrive at the invention of the Applicants' claims, *because* of the advantage of *not only* removing a portion of the non-hydrogen components out of the hydrogen-containing gas (which the "cooler" 28 of JP-302 does) *but also* shifting the reaction equilibrium to favor the production of even more hydrogen by sweeping the permeated hydrogen away from the face of the membrane, as described on pgs. 5 and 6 in the English translation of JP-302. Thus, the applicants' argued arrangement is obvious from the known method discussed on the last paragraph on pg. 6 in the English translation of JP-302.

b) *The applicants argue that in JP-302 the hydrogen is rejected by the membrane, whereas in the applicants' claims the stream that is treated is separated by two membranes, and the gas permeates through these two membranes.*

The applicants are incorrect in their description of JP-302 in as much as pg. 7, 2nd full paragraph in the English translation of JP-302 describes the hydrogen as passing through both the 1st and 2nd hydrogen permselective membranes – in the same manner that the applicants argue is the case for their invention.

c) *The applicants argue that their process can use catalysts in more than one region, whereas JP-302 only uses catalysts in a single region as a fixed bed reactor.*

The argument is incomplete because it does not point out which claim contains the argued limitation. There is nothing the applicants' independent claim 134 requiring the additional catalytic regions.

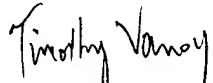
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy C. Vanoy whose telephone number is 703-308-2540. The examiner can normally be reached on 8 hr. days.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman, can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.


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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Timothy Vanoy/tv
July 8, 2003


Timothy Vanoy
Patent Examiner

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